REMARKS

By this amendment, claims 3, 12, 16, 18-25, 33, 34 and 40 have been amended in the application. Currently, claims 3, 5, 7, and 9-41 are pending in the application.

Claim 3, 5, 7 and 9-41 were rejected under 35 USC 112, second paragraph, as being indefinite. By this amendment, claims 3, 12, 16, 18-25, 33, 34 and 40 have been amended to recite "adding a slurry, which includes the core particles prepared by said step of (I), to an initial thin film-forming solution" as the Examiner suggested. It is therefore respectfully submitted that the amendments to claims 3, 12, 16, 18-25, 33, 34 and 40 should be entered since they will overcome this rejection.

Claims 3, 5, 7 and 9-41 were rejected under 35 USC 103(a) as being obvious over Kawakami et al. (JP 1-242782). Also, claims 3, 5, 7 and 9-41 were rejected under 35 USC 103(a) as being obvious over Kawakami et al. in view of Kaneyoshi (U.S. Patent Application Publication No. 2001-0055685). Also, claims 3, 5, 7 and 9-41 were rejected under 35 USC 103(a) as being obvious over Kawakami et al. or Kawakami et al. in view of Kaneyoshi and further in view of Svendsen et al. (U.S. Patent No. 5,262,718). Further, claims 3, 5, 7 and 9-41 were rejected under 35 USC

103(a) as being obvious over Kawakami et al. or Kawakami et al. in view of Kaneyoshi or over Kawakami et al. in view of Svendsen et al. or Kawakami et al. in view of Kaneyoshi, further in view of Svendsen et al., and further in view of Weber et al. (U.S. Patent No. 6,274,241). Further, claims 3, 5, 7 and 9-41 were rejected under 35 USC 103(a) as being obvious over the cited prior art as applied above and further in view of Segawa et al. (JP 2001-316834).

These rejections are respectfully traversed in view of the remarks below.

The present invention relates to a conductive electroless plated powder and a method for making the same. More particularly, the present invention relates to a conductive electroless plated powder provided with nickel films having improved heat resistance (see page 1, lines 7-11 of the specification).

In the nickel film of the plated powder of the present invention, many columnar structures extending in the direction of the thickness gather tightly to form a dense, homogeneous, and continuous film as shown in Fig. 1. On the other hand, in the nickel film of the conventional plated powder shown in Fig. 2, the crystal grains are rough and heterogeneous. The present inventors have found that,

in the nickel film having the columnar structures as shown in Fig. 1, unexpected results have been found which include that the heat resistance is high and the conductivity of the plated powder is not really decreased even under high temperature conditions (see page 5, lines 9-19 of the specification).

The present invention discloses that the initial thin film formation step is carried out to deposit nickel uniformly on the core particles and to smooth the surfaces of the core particles. In the initial thin film formation step, first, the core particles supporting the noble metal are dispersed in water thoroughly. A shear dispersing machine, such as a colloid mill or homogenizer, may be used for the dispersion. When the core particles are dispersed, for example, a dispersing agent, such as a surfactant, may be used as necessary. The aqueous suspension thus prepared is mixed and dispersed in an initial thin film-solution containing nickel ions, a reducing agent, and a complexing agent composed of an amine. Thereby, the reduction of nickel ions is started, and nickel initial thin films are formed on the surfaces of the core particles. Since the initial thin film formation step is carried out to deposit nickel uniformly on the core particles and to smooth the surfaces of the core particles, the resultant initial thin nickel film only requires

a small thickness which enables smoothing the surfaces of the core particles.

The present invention also discloses that it is important to involve a complexing agent in the initial thin film-forming solution. By incorporating the complexing agent in the initial thin film-forming solution and by incorporating the complexing agent in the nickel ion-containing solution, it is possible to form a nickel film having columnar structures (see page 12, lines 20-26 of the specification).

In the electroless plating step, a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, are added to the aqueous suspension individually and simultaneously. The aqueous suspension contains the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed.

Independent claims 3, 16, 33 and 34 recite "(II) adding a slurry, which includes the core particles prepared by said step of (I), to an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the

initial thin film-forming solution, and reducing the nickel ions to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed".

Similarly, independent claim 40 recites "(II) adding a slurry, which includes the core particles prepared by said step of (I), to an initial thin film-forming solution containing 1) nickel ions, 2) a reducing agent including one of sodium hypohosphite, sodium borohydride, potassium borohydride, dimethylamine borane, hydrazine and formalin, and 3) a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and wherein said step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 4 x 10^{-4} and 2.0 mol/l so

that the nickel ions are reduced to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed". These features are not shown or suggested by Kawakami et al., Kaneyoshi, Svendsen et al., Weber et al. and Segawa et al. or any combination of these references.

Kawakami et al. relate to an electroless plated powder and a production process therefore (see page 1, lines 14-15 of the translation).

Kawakami et al. disclose the step of adding at least two solutions constituting the electroless plating solution individually and simultaneously to the aqueous suspension to perform an electroless plating (see page 18, line 23 - page 19, line 6 of the translation).

Kawakami et al. also disclose the concentration of each agent can be set within the saturation concentration and is not

particularly limited. However, since low concentration is not economical, the lower limit is naturally limited from the practical point of view (see page 20, lines 1-5 of the translation).

Kawakami et al. also disclose that by adding the plating solution, plating reaction starts promptly. If the individual agents are added at the proper ratio all of the metal salt added is reduced and deposited on the surface of the core material. Consequently, the thickness of the plating film can be controlled arbitrarily depending on the amount of addition (page 21, lines 7-12 of the translation).

Kawakami et al. do not disclose the steps of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and reducing the nickel ions to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and

simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claims 3, 16, 33 and 34.

Kawakami et al. also do not disclose the step of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing 1) nickel ions, 2) a reducing agent including one of sodium hypohosphite, sodium borohydride, potassium borohydride, dimethylamine borane, hydrazine and formalin, and 3) a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and wherein the step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 4×10^{-4} and 2.0 mol/l so that the nickel ions are reduced to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a

reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claim 40.

Applicants note that in the office action, the Examiner disagreed with the applicants' arguments that Kawakami et al. do not need to reapply the additional plating solution after completing the plating film on the core particles. The Examiner believed that Kawakami et al. taught that a plating solution having a saturation concentration of each agent can be used. The Examiner also believed that since the saturation concentration was limited, the desired thickness might not be obtained in a single plating operation if the desired thickness was thicker than the thickness that can be obtained in a single plating operation (see page 5, line 13 - page 6, line 2 of the office action).

Applicants respectfully traverse the above Examiner's assumptions for the reasons discussed below.

Applicants respectfully submit that event though the concentration of each agent can be set within the saturation

concentration, the amount of each agent is not limited based on adjusting the entire amount of the plating solution. In other words, if the entire amount of the plating solution is increased, the saturation concentration does not affect the amount of each agent.

The Examiner believed that the desired thickness might not be obtained in a single plating operation if the desired thickness was thicker than the thickness that can be obtained in a single plating operation. However, applicants respectfully submit that it is completely reasonable to assume that Kawakami et al. would increase the entire amount of the plating solution to obtain the desired thickness in a single plating operation since Kawakami et al. wants to do the plating operation in a single plating operation. Kawakami et al. disclose that the thickness of the plating film can be controlled arbitrarily depending on the amount of addition (see page 21, lines 11-13 of the translation). Thus, even though there is the saturation concentration of each agent, the amount of addition (metal salt) is easily increased by adjusting the entire amount of the plating solution.

In addition, in the method of Kawakami et al., there is no reason to reapply the additional plating solution after

completing the plating films on the core particles because the method of Kawakami et al. adds the plating solution in the aqueous suspension only one time and controls the thickness of the plating film based on adjusting the amount of addition. Applicants respectfully submit that Kawakami et al. would not want to reapply the plating solution after completing the plating films on the core particles because it requires the extra steps and takes more time and efforts.

On the other hand, in the present invention, there is a reason that the two plating solutions are added in the aqueous suspension containing the core particles provided with the initial thin nickel films (the claimed step III) because the present invention intends to make columnar structures extending in a direction of a thickness of a nickel film. By this method in the present invention, the conductive electroless plated powder of the present invention is provided with high heat resistance and the conductivity of the plated powder is not really decreased even under high temperature conditions.

For these reasons, it is believed that Kawakami et al. do not show or suggest the present claimed features of the present invention. Applicants also submit that Kaneyoshi does not make up for the deficiencies in Kawakami et al.

Kaneyoshi relates to a conductive filler which is formulated in rubber and resin compositions to impart conductivity to molded parts thereof (see page 1, paragraph [0001]).

Kaneyoshi discloses that a catalyzed powder was obtained by using the same core powder and following the same procedure as in the electroless copper plating. The catalyzed powder was dispersed in 135 cm^3 of water by agitation, forming a slurry. Separately, 4 dm^3 of a plating solution was furnished by dissolving 0.043 mol/dm^3 of nickel sulfate, 0.092 mol/dm^3 of sodium hypophospite and 0.05 mol/dm^3 of citric acid in water, adding aqueous ammonia thereto for adjusting to pH 8.8 and heating at a temperature of 45 °C. With stirring, the slurry was added to this plating solution. While stirring was continued, a reaction took place for 15 minutes, depositing an electroless nickel-phosphorus alloy plating film as the lower layer. At the end of reaction, the powder was separated by filtration on a Buchner funnel and washed by spraying about 1 dm^3 of water (see page 3, paragraph [0032]).

Kaneyoshi does not disclose the steps of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an

amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and reducing the nickel ions to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claims 3, 16, 33 and 34.

Kaneyoshi also does not disclose the step of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing 1) nickel ions, 2) a reducing agent including one of sodium hypohosphite, sodium borohydride, potassium borohydride, dimethylamine borane, hydrazine and formalin, and 3) a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and wherein the step of dispersing the core particles

in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 4×10^{-4} and 2.0 mol/l so that the nickel ions are reduced to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claim 40.

For these reasons, it is believed that Kaneyoshi does not show or suggest the present claimed features of the present invention. Applicants also submit that Svendsen et al. do not make up for the deficiencies in Kawakami et al. and Kaneyoshi.

Svendsen et al. relate to anisotropically electrically conductive articles and methods of making them (see col. 1, lines 11-12).

Svendsen et al. disclose that the thickness of the metal layer inside the pores is enhanced by re-applying electroless

plating to the membrane until the desired thickness has been reached; at the same time protrusions of approximately the same height as the thickness of the metal wall inside the pores are formed at the pore surfaces (see col. 5, lines 55-60).

Svendsen et al. do not disclose the steps of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and reducing the nickel ions to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claims 3, 16, 33 and 34.

Svendsen et al. also do not disclose the step of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing 1) nickel ions, 2) a reducing agent including one of sodium hypohosphite, sodium borohydride, potassium borohydride, dimethylamine borane, hydrazine and formalin, and 3) a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and wherein the step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 4×10^{-4} and 2.0 mol/l so that the nickel ions are reduced to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claim 40.

Applicants respectfully submit that the method of Kawakami et al. teaches away from the method discussed in Svendsen et al. because of the following reasons.

As discussed above, Kawakami et al. disclose that the thickness of the plating film can be controlled arbitrarily depending on the amount of addition (see page 21, lines 11-13 of the translation). In other words, the method of Kawakami et al. adds the plating solution in the aqueous suspension only one time and controls the thickness of the plating film based on adjusting the amount of addition.

On the other hand, Svendsen et al. disclose that the thickness of the metal layer inside the pores is enhanced by re-applying electroless plating to the membrane until the desired thickness has been reached (see col. 5, lines 55-57). Applicants respectfully submit that the method of Kawakami et al. teaches away from using the method discussed in Svendsen et al. because the desired thickness in Kawakami et al. is reached by adding the plating solution in the aqueous suspension only one time based on adjusting the amount of addition. The method of Kawakami et al. does not need to reapply electroless plating multiple times as discussed in Svendsen et al. to reach the desired thickness.

Therefore, it would not have been obvious to combine the method of Kawakami et al. and the method of Svendsen et al.

In addition, the desired thickness by reapplying electroless plating multiple times as described in Svendsen et al. do not make uniform or continuous columnar structures extending in a direction of a thickness of a nickel film as claimed in the present invention. On the other hand, the present invention discloses the initial thin film formation step (the claimed step (II)) for forming an initial thin nickel film, and the electroless plating step (the claimed step (III)) for performing electroless plating so that these steps are capable of providing uniform and continuous columnar structures extending in a direction of a thickness of a nickel film.

Moreover, the method of Kawakami et al. and the method of Svendsen et al. do not describe or suggest that the same type of complexing agent as that contained in the aqueous suspension containing the powder of a core material having an initial thin film on the surface thereof is used as the complexing agent in a plating solution. Specifically, independent claims 3, 16, 33, 34 and 40 recite the phrases "a complexing agent" used in step (II) and "the complexing agent" used in step (III). Applicants respectfully submit that these phrases clearly show that the

complexing agent used in step (II) and the complexing agent used in step (III) are the same type of complexing agent.

For these reasons, it is believed that Svendsen et al. do not show or suggest the present claimed features of the present invention. Applicants also submit that Weber et al. do not make up for the deficiencies in Kawakami et al., Kaneyoshi and Svendsen et al.

Weber et al. relate to a substrate, a method of nucleation, a powder, and a method for metal plating (see column 1, lines 6-7). Glass substrates in the form of plates of glass or glass powder were nucleated with palladium and then coated with a layer of nickel/tungsten (see column 3, lines 49-52).

Weber et al. also disclose that in addition to the Ni/W alloy, layers including alloys such as Ni/Sn, Co/W and Co/Mo, a single metal such as Ni, Cu, Ag, Au and platinum metals or metal oxide can be applied (see column 5, line 45-48).

Weber et al. do not disclose the steps of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and reducing

the nickel ions to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claims 3, 16, 33 and 34.

Weber et al. also do not disclose the step of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing 1) nickel ions, 2) a reducing agent including one of sodium hypohosphite, sodium borohydride, potassium borohydride, dimethylamine borane, hydrazine and formalin, and 3) a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and wherein the step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-

forming solution in the range between 4 x 10^{-4} and 2.0 mol/l so that the nickel ions are reduced to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claim 40.

For these reasons, it is believed that Weber et al. do not show or suggest the present claimed features of the present invention. Applicants also submit that Segawa et al. do not make up for the deficiencies in Kawakami et al., Kaneyoshi, Svendsen et al. and Weber et al.

Segawa et al. relate to apparatus for electroless plating and method for forming conductive film.

Segawa et al. disclose an apparatus for an electroless plating capable of suppressing a change of a plating liquid with time and carrying out electroless plating homogeneously and

accurately, and provide a method for forming a conductive film (abstract).

Segawa et al. do not disclose the steps of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing nickel ions, a reducing agent, and a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and reducing the nickel ions to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claims 3, 16, 33 and 34.

Segawa et al. also do not disclose the step of (II) adding a slurry, which includes the core particles prepared by the step of (I), to an initial thin film-forming solution containing 1)

nickel ions, 2) a reducing agent including one of sodium hypohosphite, sodium borohydride, potassium borohydride, dimethylamine borane, hydrazine and formalin, and 3) a complexing agent comprising an amine to prepare an aqueous suspension, dispersing the core particles in the initial thin film-forming solution, and wherein the step of dispersing the core particles in an initial thin film-forming solution containing nickel ions includes adjusting the reducing agent in the initial thin film-forming solution in the range between 4×10^{-4} and 2.0 mol/l so that the nickel ions are reduced to form initial thin nickel film on a surface of each of the core particles; and (III) adding a first solution, which contains a nickel ion-containing solution and the complexing agent, and a second solution, which contains a reducing agent, to the aqueous suspension individually and simultaneously, the aqueous suspension containing the core particles provided with the initial thin nickel films and the complexing agent to perform electroless plating so that columnar structures extending in a direction of a thickness of a nickel film are formed as claimed in independent claim 40.

It is therefore respectfully submitted that Kawakami et al., Kaneyoshi, Svendsen et al., Weber et al. and Segawa et al., individually or in combination, do not teach, disclose or suggest

the presently claimed invention and it would not have been obvious to one of ordinary skill in the art to combine these references to render the present claims obvious.

In view of foregoing remarks, it is respectfully submitted that the application is in condition for allowance and an action to this effect is respectfully requested.

If there are any questions or concerns regarding these remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

Date: August 17, 2009

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